

AMENDMENTS TO THE DRAWINGS

- (1) Please replace original formal Figure 12 with the informal Replacement Sheet for Figure 12A; and
- (2) Please replace informal Figure 12A, submitted by the Amendment of August 19, 2004, with the informal Replacement Sheet for Figure 12B.

REMARKS

Summary of the Amendment

Upon entry of the present Amendment, paragraphs [0022], [0062] and [0066] of the specification will have been amended. Also, formal Figure 12 and informal Figure 12A will have been replaced with Replacement Sheets for Figures 12A and 12B.

Furthermore, Claims 1, 4, 9, 16-17, 22-23 and 28-29 will have been amended, and Claim 5 will have been cancelled without prejudice or disclaimer. Accordingly, Claims 1, 3-4, 6-12, 14-17, 19-24, 26-31 and 33-52 are currently pending in the present application, while Claims 2, 13, 18, 25 and 32 are withdrawn from prosecution.

By the present Amendment and Remarks, Applicant submits that the rejections have been overcome, and respectfully requests reconsideration of the outstanding Final Office Action and allowance of the present application.

Amendment is Proper for Entry

Applicant submits that the present After Final Amendment is proper for entry because the amendment places the application in condition for allowance. It is believed that no new issues are raised with respect to the merits of the case. Moreover, further searching does not appear to be required. Therefore, Applicant respectfully requests that the Examiner enter the present After Final Amendment and consider the merits of the same.

Summary of the Final Office Action

In the subject Office Action, the drawings have been objected to over matters pertaining to form. Moreover, the Amendment filed on August 24, 2004 is objected to because the Examiner contends that it introduces new matter into the disclosure. On the issue of patentability, Claims 17, 20 and 21 are rejected under 35 U.S.C. §102(b) as being anticipated over the art of record. Furthermore, Claims 1, 3-12, 14-16, 19, 23-24, 26-31 and 33-52 are rejected under 35 U.S.C. §103(a) as being unpatentable over the art of record.

Objection to the Drawings

The drawings are objected to as failing to comply with 37 C.F.R. §1.84(p)(5) because they do not include the reference sign “Figure 12B” mentioned in the description.

Applicant has submitted an informal Replacement Sheet directed to “FIG. 12A” to replace original formal Figure 12, and submitted an informal Replacement Sheet directed to “FIG. 12B” to replace informal Figure 12A, which was submitted by the Amendment dated August 19, 2004.

The Applicant’s intention is to provide Figure 12A, which is directed to a first exemplary embodiment of a semiconductor package discussed in paragraphs [0062] through [0065] of the specification. It is also the Applicant’s intention to further provide Figure 12B, which is directed to a second exemplary embodiment of a semiconductor package as discussed in paragraph [0066], aspects of which were originally recited in Claims 21 and 27 when the subject application was originally filed.

With regard to the informal Replacement Sheet directed to “FIG 12A”, Applicant has changed “12” to -- 12A -- since it is the Applicant’s intention to no longer have a Figure 12 included in the specification, i.e. the Applicant has replaced original Figure “12” with Replacement Sheet -- 12A -- . Additionally, Applicant has changed reference numerals “200/202” to -- 120 -- to more accurately refer to leads which are derived from leadframe 120 of Figure 2A.

With regard to the informal Replacement Sheet directed to “FIG 12B”, Applicant has changed “12A” to -- 12B -- . Additionally, Applicant has changed reference numerals “200/202” to -- 130/140 -- to more accurately refer to leads which are derived from leadframes 130 and 140 of Figures 4A and 5, respectively.

Accordingly, Applicant respectfully requests that the Examiner approve the aforementioned amendments to the Figures as explained above, and to indicate such approval in this next Office Action before formal drawings are submitted.

Traversal of Objection under 35 U.S.C. §132

The Examiner has objected to the Amendment of August 19, 2004 under 35 U.S.C. §132 because the Examiner contends that it introduces new matter into the disclosure. In

particular, the Examiner submits that the added material which is not supported by the original disclosure is "Figure 12B."

As discussed above in the "Objection to the Drawings" Section, Applicant has submitted an informal Replacement Sheet directed to "FIG. 12A" to replace original formal Figure 12, and submitted an informal Replacement Sheet directed to "FIG. 12B" to replace informal Figure 12A, which was submitted with the Amendment of August 19, 2004.

The Applicant submits that no new matter has been introduced with the addition the informal Replacement Sheet directed to "FIG. 12B" since the support for the informal Replacement Sheet directed to "FIG. 12B" is found in paragraph [0066] of the originally filed specification which stated (before amendment):

"[0066] Leadframes 130 and 140 of FIGS. 4A and 5A, respectively, may be provided in packages similar to package 1400 of FIG. 12. In a package made with leadframe 140, the semiconductor chip 1402 is mounted on inner segments 200a, 202a in a flip chip style."

Accordingly, Applicant believes the objection to the amendment to the drawings has been overcome, and therefore respectfully requests the Examiner's indication of the same in the next Office Action

Traversal of Rejection under 35 U.S.C. §102(b)

Applicant respectfully traverses the rejection of Claims 17 and 20-21 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,283,839 to Gursky [hereinafter "GURSKY"].

The Examiner submits that GURSKY teaches a leadframe comprising a plurality of adjacent pairs of leads 28, 30 each including an inner end segment beginning at an inner end 36 of the lead, wherein the inner end segments each include a recessed surface 44, and recessed surfaces of the inner end segments of the leads of each of the pairs are oppositely oriented; wherein the recessed surface of one of the leads (28 or 30) of the pairs does not extend to the inner end of a lead, and those leads extend further toward a "center" of the leadframe than the other lead (the other of 28 or 30) of the respective pair; wherein a semiconductor chip 52 is in a flip chip electrical connection with the inner end segments (see column 6, lines 5-30; column 7, lines 20-44; column 8, lines 27-35; column 8, line 47; column 9, line 9). In an attempt to further clarify the disclosure that leads (28 or 30), extend

further toward a center of the leadframe than the other lead (the other of 28 or 30) of the respective pair, the Examiner notes that leads 28 extend a greater distance along the greater lengths of the leads toward the center than leads 30, and leads 30 extend to a more advanced point toward the center than leads 28.

A Review of GURSKY

The GURSKY invention relates to carrier tapes for semiconductor devices, and in particular, to patterns of lead clusters and carrier tapes and methods of bonding chips to lead clusters. The tapes are passed over a plate for carrying a multitude of semiconductor chips. A chip 52 is picked up from its supporting plate after it is bonded to the tape at each indexing cycle. The chips 52 are then bonded to clusters of leads (see Figures 2 and 4). These leads are either fabricated out of the tape itself or they are fabricated out of material adhered to a tape substrate. The tape leads are called inner leads because each lead is later bonded to an outer lead. The outer leads are then inserted to the board of a circuit pack. All carrier tapes include conductive material such as copper sheet out of which leads are formed.

Figure 2 of GURSKY shows a pattern 27 in a foil tape 20 which provides a structural margin 26 interrupted by sprocket holes 22. The cluster 24 is shown having sixteen finger-like leads 28 and 30, each having free ends 36 which project toward the center 38 of the cluster. The leads 28 and 30 also have opposite ends 34 that are fixed to margins 25 or medial planes 26.

Figure 4 of GURSKY shows a completed assembly of inner lead cluster 24 attached to chip 52. Chip 52 is bonded to the free ends 36 of the leads 28 and 30. Opposite fixed ends 34 remain fixed to the tape. Leads 28 and 30 are stressed uniformly to form the desired shape in the lead cluster 24. Each lead 28 or 30 forms a part of a four-cornered bell-like shape 51. The free ends 36 of the leads 28, 30 are simultaneously bonded to pads on the chip 52 by thermo compression methods. It is noted that the inner leads 28, 30 are too fragile for use so they must be bonded to stiff outer leads. The outer leads are then connected to the outside world. The stiff outer leads are formed in a strip of metal and clusters much like the clusters of the inner leads. However, there is a much larger hole in the center of the outer lead cluster and the lead and the strip is of thicker metal. This strip is called a "leadframe" by those skilled in the art.

Figure 5C of GURSKY shows grooves 44 which are formed at site or region 39 of the leads 28, 30 (see Figure 5A). A groove 44 is cut out of the top of the lead 28, 30 and another one is cut out of the underside of the lead 28, 30. The specification further states that only one groove 44 is necessary providing the strength of the site is sufficiently reduced to avoid stress transmittal into the tape markings.

Applicant's Independent Claim 17 (and Dependent Claim 20-21)

Applicant's independent Claim 17 as amended recites, *inter alia*, [a] leadframe comprising a plurality of adjacent pairs of leads *each including an inner segment which defines an inner end of the lead and has a recessed surface, and an outer portion extending from the inner segment*, the recessed surfaces of the inner end segments of the leads of each of the pairs being oppositely oriented. Applicant submits that GURSKY does not teach the aforementioned features recited in independent Claim 17.

As best shown in Figure 2 of GURSKY, a tape 20 is provided which has pairs of leads 28 and 30. As already noted in the review of GURSKY, the tape 20 is not the typical structural rigid "leadframe" formed from a thin sheet of metal. At the free end 36 of each lead 28, 30 is a thin finger-like projection pointing toward an opening region 38 of the tape adapted to eventually receive chip 52 (see Figure 4). As best understood from the Examiner's rejection, it appears the Examiner has construed the entire lead 28 or 30 to be considered or interpreted as the "inner end segment" of the present invention as originally recited in Claim 17. In particular, it appears the Examiner even considers the grooves 44 (see Figure 5C) as part of the "inner end segment" of the present invention. Applicant respectfully submits that the Examiner's aforementioned interpretation/characterization of the GURSKY leads 28, 30 is inaccurate considering that the entire length of each GURSKY lead 28, 30 appears to be bound by grooves 44 on one end and free ends 36 on the other end. Therefore, the Examiner's characterization erroneously implies that grooves 44 are within the "inner end segment" of the leads 28, 30 when in actuality it appears a more reasonable interpretation would be that the GURSKY leads 28, 30 have the finger-like portion formed at the free end 36 of the leads 28, 30 and the grooves 44 are formed at an "outer end" of the leads 28, 30 where the leads connect to the structural margin 26 of the tape 26. It certainly does not make sense to characterize the GURSKY leads 28, 30 entirely as "an inner end

segment” without there also being at least an implied outer segment or portion of the lead 28, 30.

Since GURSKY fails to disclose at least the above-noted features of the present invention, Applicant submits that GURSKY fails to disclose each and every recited feature of the present invention as recited in independent Claim 17. Therefore, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of anticipation under 35 U.S.C. § 102(b) and that this rejection is improper and should be withdrawn.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of independent Claim 17 under 35 U.S.C. § 102(b) and indicate that this claim allowable.

Furthermore, Applicant submits that dependent Claims 20 and 21 are allowable at least for the reason that these claims depend from allowable independent Claim 17 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 20 and 21 under 35 U.S.C. § 102(b) and indicate that these claims are allowable.

Traversal of Rejection Under 35 U.S.C. §103(a)

TANAKA ‘399 in view of TANAKA ‘053:

Applicant respectfully traverses the rejection of Claims 1, 6-12, 14, 16-17, 19, 23-24, 29-31 and 33 under 35 U.S.C. §103(a) as being unpatentable over Japanese Patent No. JP10135399 to Tanaka [hereinafter “TANAKA ‘399”] and Japanese Patent No. JP61170053 to Tanaka [hereinafter “TANAKA ‘053”].

The Examiner contends that TANAKA ‘399 and TANAKA ‘053 teach all of the features of the aforementioned claims, except however, the Examiner admits that TANAKA ‘399 does not appear to explicitly disclose wherein a second subset of the leads each include a recess in the second surface of the lead at the inner end; said inner end segments each including a recessed surfaces; and wherein each recess has a vertical depth that is more than half of a vertical height of a lead.

Nevertheless, the Examiner submits that, in the English abstract and drawings, TANAKA '053 discloses wherein leads each include a recess in the second surface of the lead at the inner end segment 2; said inner end segments each including a recessed surface; and wherein each recess has a vertical depth that is more than half of a vertical height of a lead. The Examiner further submits that it would have been obvious to combine the product of TANAKA '053 with the product of TANAKA '399 so that the second subset of the leads each include a recess in the second surface of the lead at the inner end segment (see drawing 3), and wherein each recess has a vertical depth that is more than half of a vertical height of the lead, because it would provide a narrow lead interval which is disclosed as desirable by both TANAKA '399 and TANAKA '053.

The Examiner further admits that the combination of applied prior art does not appear to explicitly disclose that the leads are situated such that the recesses in the inner end segments of the leads of each pair of adjacent leads are oriented in opposite directions; wherein the recessed surfaces of the leads of each set pair of adjacent leads are spaced apart a first distance in a vertical direction; wherein the distance is greater than half a vertical height of an unrecessed portion of the lead; and the recess surfaces of the inner end segments of the leads of such of each of the pairs are oppositely oriented. However, the Examiner submits that the aforementioned limitations are inherent properties of the product of the combination of applied prior art.

Additionally, the Examiner admits that the combination of applied prior art does not appear to explicitly disclose wherein the second distance is approximately zero; and wherein the second distance is zero. However, the Examiner contends that both TANAKA '399 and TANAKA '053 disclose the desirability of narrow lead intervals; and thus, they disclose that horizontal lead distance is a result-effective variable. Moreover, the Examiner contends that it would have been obvious as a design choice bounded by well known manufacturing constraints ascertainable by routine experimentation and optimization to choose the particular claimed horizontal lead distance limitations because Applicant has not disclosed that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima-facie that the process would possess utility using another distance.

Moreover, the Examiner submits that although the combination of applied prior art does not appear to explicitly disclose that the first distance is greater than a second distance in a horizontal direction between closest portions of the recessed surfaces of the leads of each of the pairs of adjacent leads, this is an inherent property of the product of the combination of the applied prior art because the first distance is inherently greater than the second distance of approximately zero.

TANAKA '399

Figures 1(a) and 1(b) of TANAKA '399 disclose a QFP 28 (quad flat package) including chip 22 having terminal pads 23 (23a, 23b) arranged in zig-zag orientation on an upper surface of the chip 22. A plurality of leads 19 (19a, 19b) are provided in which with every other inner lead 19 there is a level difference 19a formed by half etching (see Figure 19(b)). A lower stage wire 24a is bonded between the outer pad 23a and the level difference 19a of the inner lead 19 whereas an upper stage wire 24b is bonded between the inner pad 23b and the level difference 19b of the inner lead 19a. Upper and lower stage wires 24a and 24b are arranged contiguously while alternating. Since the gap between adjacent upper and lower stage wires 24a and 24b can be widened, wire shorts can be prevented even if the wire is deflected at the time of forming a resin sealing body 26. Also, the inner lead pitch can be set wider when the wire contact margin is set equal to a conventional value.

A Review of TANAKA '053

Figures 1-4 of TANAKA '053 discloses a leadframe package (see in particular Figures 2-3) comprising leads 3 having recessed portions 2, die pad 1, chip 7 and encapsulant 9 forming the body of the package. From Figures 2 and 3, it is noted that the recesses 2 are either formed on the top of the leads 3 or on the bottom of the leads 3.

Applicant's Independent Claim 1 (and Dependent Claims 6-8)

Applicant's independent Claim 1 as amended recites, *inter alia*, each lead comprising a first surface, an opposite second surface, an inner end segment which defines an inner end of the lead, and an outer portion extending from the inner end segment, wherein a first subset of the leads each include a recess in the first surface of the lead at the inner end

segment, *a second subset of the leads each include a recess in the second surface of the lead at the inner end segment, and the individual leads of the first subset are situated in an alternating lateral pattern with the individual leads of the second subset such that the recesses in the inner end segments of the leads of any pair of adjacent leads are oriented in opposite directions.*

Applicant submits that neither TANAKA '399 nor TANAKA '053, whether considered individually or in combination, teach the aforementioned features as recited in independent Claim 1. For instance, TANAKA '399 appears to only teach a first subset of the leads which include a recess 19a in the first surface of the lead at the inner end segment, but not *a second subset of the leads [which] each include a recess in the second surface of the lead at the inner end segment.* As shown in Figure 1b of TANAKA '399, the surface opposing surface 19b (i.e., the bottom surface of the leftmost lead 19) has no recessed surface at all. Instead, at best TANAKA '399 only teaches recesses 19a in the inner end segments of only one subset of leads, not two subsets, much less the arrangement of alternating and oppositely oriented recesses on both the first and second subsets of leads, as is recited in independent Claim 1.

With respect to TANAKA '053, Figures 1-3 clearly only show recesses 2 formed on only one side of the leads 3. TANAKA '053 does not teach or suggest the arrangement of alternating and oppositely oriented recesses on both first and second subsets of leads, as is recited in independent Claim 1. For instance, TANAKA '053 does not even teach alternating from a lead with a recess 19a to a lead without a recess 19b (see Figure 1b), as is taught by TANAKA '399. *If anything, TANAKA '053 teaches away from the features recited in Claim 1.* For example, it appears that the TANAKA '053 reference teaches and or at least suggests that the recesses 2 are to be formed consistently on only one side of the leads 3. Thus, TANAKA '053 does not appear to provide any additional teaching or suggestion, as purported by the Examiner, which remedy the deficiencies of TANAKA '399.

Since neither TANAKA '399 nor TANAKA '053 teach or suggest the aforementioned features, no proper combination of these references can render unpatentable the combination of the features recited in at least independent Claim 1. Therefore, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a

rejection of obviousness under 35 U.S.C. § 103(a) and that this rejection is improper and should be withdrawn.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of independent Claim 1 under 35 U.S.C. § 103(a) and indicate that this claim allowable.

Furthermore, Applicant submits that dependent Claims 6-8 are allowable at least for the reason that these claims depend from allowable independent Claim 1 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 6-8 under 35 U.S.C. § 103(a) and to indicate that these claims are allowable.

Applicant's Independent Claims 9 and 29 (and Dependent Claims 10-12, 14, 16, 30-31 and 33)

Applicant's independent Claims 9 and 29, as amended recite, *inter alia*, . . . wherein each lead . . . *has a recessed surface*, . . . and, *wherein the recessed surfaces of the leads of each said pair of adjacent leads are spaced apart a first distance in a vertical direction*, and said first distance is greater than a second distance in a horizontal direction between closest portions of the recessed surfaces of the leads of each said pair of adjacent leads.

Applicant submits that neither TANAKA '339 nor TANAKA '053, whether considered individually or in combination, teach the aforementioned features as recited in independent Claims 9 and 29. For instance, TANAKA '339 only teaches recesses 19a formed on every other lead 19. The other lead (next to the lead 19 having the "level difference" 19a) does not even include a recess. Instead, at best TANAKA '339 only teaches recesses 19a formed in the inner end segments of only one of the leads of the pair, not both leads of the pair.

With respect to TANAKA '053, Figures 1-3 clearly only show recesses 2 formed on only one side of the leads 3. TANAKA '053 does not teach or suggest an arrangement wherein the recessed surfaces of the leads of each said pair of adjacent leads *are spaced apart a first distance in a vertical direction*, as is recited in independent Claims 9 and 29. If

anything, TANAKA '053 *teaches away* from the features recited independent Claims 9 and 29. For instance, it appears that TANAKA '053 reference actually teaches that the recesses 2 are to be formed consistently on only one side of the leads 3. Thus, TANAKA '053 does not appear to provide any additional teaching or suggestion, as purported by the Examiner, which remedy the deficiencies of TANAKA '399.

Because neither TANAKA '399 nor TANAKA '053 teach or suggest the aforementioned features, no proper combination of these references can render unpatentable the combination of the features recited in at least independent Claims 9 and 29. Therefore, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of obviousness under 35 U.S.C. § 103(a) and that these rejections are improper and should be withdrawn.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of independent Claims 9 and 29 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

Furthermore, Applicant submits that dependent Claims 10-12, 14, 16, 30-31 and 33 are allowable at least for the reason that these claims depend from allowable independent Claims 9 and 29 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 10-12, 14, 16, 30-31 and 33 under 35 U.S.C. § 103(a) and to indicate that these claims are allowable.

Applicant's Independent Claims 17 and 23 (and Dependent Claims 19 and 24)

Applicant's independent Claims 17 and 23, as amended recite, *inter alia*, a plurality of adjacent pairs of leads *each including an inner segment which has a recessed surface, , the recessed surfaces of the inner end segments of the leads of each of the pairs being oppositely oriented.*

Applicant submits that neither TANAKA '339 nor TANAKA '053, whether considered individually or in combination, teach the aforementioned features as recited in independent Claims 17 and 23. For instance, TANAKA '339 only teaches recesses 19a formed on every other lead 19. The other lead (next to the lead 19 having the "level difference" 19a) does not even include a recess. Instead, at best TANAKA '399 only teaches

recesses 19a in the inner end segments of only one of the leads of the pair, not both leads of the pair.

With respect to TANAKA '053, Figures 1-3 clearly only show recesses 2 formed on only one side of the leads 3. Thus, TANAKA '053 does not teach, *inter alia*, *the recessed surfaces of the inner end segments of the leads of each of the pairs being oppositely oriented*. If anything, TANAKA '053 *teaches away* from the features recited independent Claims 17 and 23. Indeed, it appears that TANAKA '053 reference teaches that the recesses 2 are intended to be formed consistently on only one side of the leads 3. Thus, TANAKA '053 does not appear to provide any additional teaching or suggestion, as purported by the Examiner, which remedy the deficiencies of TANAKA '399.

Because neither TANAKA '399 nor TANAKA '053 teach or suggest the aforementioned features, no proper combination of these references can render unpatentable the combination of the features recited in at least independent Claims 17 and 23. Therefore, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of obviousness under 35 U.S.C. § 103(a) and that these rejections are improper and should be withdrawn.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of independent Claims 17 and 23 under 35 U.S.C. § 103(a) and to indicate that these claims are allowable.

Furthermore, Applicant submits that dependent Claims 19 and 24 are allowable at least for the reason that these claims depend from allowable independent Claims 17 and 23 and because they recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 19 and 24 under 35 U.S.C. § 103(a) and to indicate that these claims are allowable.

TANAKA '399 and '053 in further combination with TANIGAWA:

Applicant respectfully traverses the rejection of Claims 4-5, 22, 28, 35, 40, 43, 46 and 52 under 35 U.S.C. §103(a) over the combination of TANAKA '399 and TANAKA '053 as applied to Claims 1, 9, 17, 23 and 29, and further in combination with Japanese Patent JP03245560 to Tanigawa [hereinafter "TANIGAWA"].

The Examiner submits that TANAKA '399 discloses the leads as including a first portion between the inner segment and a dambar of the leadframe. However, the Examiner admits that the combination of TANAKA '399 and '053 do not appear to explicitly disclose wherein a width of the inner segments at the respective recess is greater than the width of the first portion of the leads; wherein a width of the inner end segments at the respective recess therein is greater than a width of the lead outward of the inner end segment; wherein a width of the inner end segment is greater than a width of the lead outward of the inner end segment; wherein the inner ends of the leads of the first subset extend further toward a center of the leadframe than the inner ends of the leads of the second subset; wherein the inner end of one lead of each of said pair extends further toward a center of the leadframe than the inner end of the other lead of the pair; and wherein the inner end of one lead of each said pair extends further toward the semiconductor chip than the inner end of the other lead of the pair.

Next, the Examiner contends that, in the English abstract and drawings, TANIGAWA discloses wherein a width of the inner end segments 4 is greater than a width of a first portion 5 of the leads 3; wherein a width of the inner end segments is greater than a width 5 of a lead outward of the inner end segment; and wherein a width of the inner end segment is greater than a width of a lead outward of the inner end segment; wherein the inner ends of the leads of a first subset extend further toward a leadframe 1 than the inner ends of the leads of a second subset; wherein the inner end of one lead of a pair extends further toward a center of the leadframe than the inner end of the other lead of the pair. The Examiner additionally submits that it would have been obvious to combine this product of TANIGAWA with the product of the combination of TANAKA '399 and '053 because it would provide a desirable narrow lead interval.

A Review of TANIGAWA

Figures 1-3 of TANIGAWA disclose a leadframe 1, the width 5 of an inner lead 3 extending toward a die pad 2 of the leadframe 1 being smaller than that of a wire bonding part 4 of the inner lead 3. The inner leads 3 are formed so that their bonding parts are staggered along the die pad 2. The aforementioned features of TANIGAWA are provided to enable a leadframe to cope with a die provided with a large number of pins by a method

wherein the width of an inner lead except its bonding part located at its tip is smaller than that of the bonding part, and the bonding parts are arranged so as to protrude alternately.

Applicant's Dependent Claims 4-5, 22, 28, 35, 40, 43, 46 and 52

For the same reasons thoroughly discussed above with respect to the rejection of independent Claims 1, 9, 17, 23 and 29, Applicant submits that neither TANAKA '339 or TANAKA '053, whether considered individually or in combination, teach the aforementioned features as recited in independent Claims 1, 9, 17, 23 and 29.

Furthermore, TANIGAWA does not remedy the deficiencies of TANAKA '339 or TANAKA '053. For instance, Figures 1-3 of TANIGAWA do not teach or suggest the arrangement of alternating and oppositely oriented recesses on both the first and second subset of leads. Instead, TANIGAWA teaches wider bonding parts 4 arranged such that bonding part 4 is alternately moved forward towards and backwards from the die pad 2, but TANIGAWA does not include any teaching whatsoever regarding any recesses formed in the first and second surfaces of the leads.

Therefore, because neither TANAKA '399, TANAKA '053 nor TANIGAWA teach or suggest the aforementioned features, no proper combination of these references can render unpatentable the combination of the features recited in at least independent Claims 1, 9, 17, 23 and 29. Therefore, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of obviousness under 35 U.S.C. § 103(a) and that these rejections are improper and should be withdrawn.

Furthermore, Applicant submits that dependent Claims 4-5, 22, 28, 35, 40, 43, 46 and 52 are allowable at least for the reason that these claims depend from allowable independent Claims 1, 9, 17, 23 and 29 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 4-5, 22, 28, 35, 40, 43, 46 and 52 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

TANAKA '399 and '053 in further combination with MIYAMOTO:

Applicant respectfully traverses the rejection of Claims 36, 38, 41, 44, 47 and 50 under 35 U.S.C. §103(a) as being unpatentable over the combination of TANAKA '399 and TANAKA '053 as applied to Claims 1, 9, 17, 23 and 29, and further in combination with Japanese Patent No. JP03024754 to Miyamoto [hereinafter "MIYAMOTO"].

The Examiner submits that the combination of TANAKA '399 and '053 discloses wherein the recesses of the second subset of the leads extend to the inner end of a lead semiconductor and wherein the recess surface of the other lead of the pair extends to the inner end of a lead. However, the Examiner admits that the combination of TANAKA '399 and '053 do not appear to explicitly disclose wherein the inner end segments of the leads of the first subset include a pedestal between the inner end of the lead and the recess; and wherein one lead of each of said pair includes a pedestal between the inner end of the lead and the recessed surface. Nevertheless, the Examiner states that MIYAMOTO discloses where the inner end segments of the leads 2 of a first subset include a pedestal 2b between the inner end of the lead and the recess 2a; and wherein one lead of a pair includes a pedestal between the inner end of the lead and the recessed surface. Additionally, the Examiner submits that it would have been obvious to combine this product with the product of the applied prior art because it would enable stable loop formation.

A Review of MIYAMOTO

MIYAMOTO discloses a process in which the tip part of a gold wire 4 is formed in a sphere type, which is pressed against a semiconductor element 3 with a bonding tool 6 fixed to a horn 5. After bonding is performed by applying heat in ultrasonic waves, a loop is formed while the gold wire 4 is sent out from the bonding tool 6. When the bonding tool 6 is pressed against the tip of the inner lead 2, a point 7 is retained and the loop is formed, which point serves as a fulcrum when a part 2b at the tip of the inner lead 2, which has not yet been subjected to coining, forms the loop. After that, the horn 5 is lifted while grasping the gold wire 4, thereby tearing off the gold wire 4. The tip of the gold wire 4 is turned into a sphere type. Thereby, stable loop formation is enabled at the time of wire bonding without changing the conventional manufacturing method. The aforementioned feature is provided in MIYAMOTO to eliminate the sag of a loop at the time of wire bonding process without

changing the manufacturing method of an IC leadframe, by starting a coining process for correcting material deformation at the time of punching, from the interior of an inner lead tip.

Applicant's Dependent Claims 36, 38, 41, 44, 47 and 50

For the same reasons thoroughly discussed above with respect to the rejection of independent Claim 1, 9, 17, 23 and 29, Applicant submits that neither TANAKA '339 or TANAKA '053, whether considered individually or in combination, teach the aforementioned features as recited in independent Claims 1, 9, 17, 23 and 29.

Furthermore, MIYAMOTO does not remedy the deficiencies of TANAKA '339 or TANAKA '053. For instance, Figures 1-6 of MIYAMOTO do not teach or suggest the arrangement of alternating and oppositely oriented recesses on both the first and second subsets of leads. Instead, MIYAMOTO teaches the inner end segments of the leads having recesses 2A and upright tips 2b, but does not teach any recesses whatsoever formed in both the first and second surfaces of the leads, such that they alternate in opposite directions. Rather, MIYAMOTO appears to only add upright tips 2b to recesses similar to those taught in TANAKA '053.

Therefore, because neither TANAKA '399, TANAKA '053 nor MIYAMOTO teach or suggest the aforementioned features, no proper combination of these references can render unpatentable the combination of the features recited in at least independent Claims 1, 9, 17, 23 and 29. Therefore, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of obviousness under 35 U.S.C. § 103(a) and that these rejections are improper and should be withdrawn.

Furthermore, Applicant submits that dependent Claims 36, 38, 41, 44, 47 and 50 are allowable at least for the reason that these claims depend from allowable independent Claims 1, 9, 17, 23 and 29 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 36, 38, 41, 44, 47 and 50 under 35 U.S.C. § 103(a) and to indicate that these claims are allowable.

TANAKA '399 and '053 and MIYAMOTO in combination with HANDA:

Applicant respectfully traverses the rejection of Claims 37, 39, 42, 45, 48, 49 and 51 under 35 U.S.C. §103(a) as being unpatentable over the combination of TANAKA '399, TANAKA '053 and MIYAMOTO, as applied to Claims 36, 38, 41, 44, 47 and 50, and further in combination with Japanese Patent No. JP59129451 to Handa [hereinafter "HANDA"].

The Examiner contends that the combination of TANAKA '399 and '053 and MIYAMOTO inherently discloses wherein the electrical connection to the lead of the pair having the pedestal is located at the pedestal because the pedestal is inherently electrically connected to the lead. However, the Examiner does admit that the combination of TANAKA '399 and '053 and MIYAMOTO does not appear to explicitly disclose wherein the inner ends of the leads of the first subset extend further toward a center of the leadframe than the inner ends of the leads of the second subset; and wherein the inner end of one lead of each said pair extends further toward a center of the leadframe than the inner end of the other lead of the pair. Nevertheless, the Examiner contends that HANDA discloses wherein the inner ends of the leads 5 of a first subset extend further toward a center of a leadframe than the inner ends of the lead 6 of the second subset; and wherein the inner end of one lead of each said pair extends further toward a center of a leadframe than the inner end of the other lead of the pair. Additionally, the Examiner contends that it would have been obvious to combine this product of HANDA with the product of the applied prior art because it would improve connection reliability.

A Review of HANDA

HANDA discloses a frame consisting of a tab 1 for pellet connection and a plural number of leads 2 arranged radially, the leads 2 being bent toward the direction of the top surface for the constituting surface of the leadframe at every other lead at the bending parts 4 thereof, and leads 5 not bent in the lower stage being protrudely formed compared with leads 6 in the upper stage. Accordingly, even though the deformation of leads is brought about, it is possible to perform a bonding because the wire-bonding areas of leads 5 are shaded by the leads 6, and even though the deformation of leads and the vibration at the lead point are generated after a wire-bonding is performed, the under surfaces of the leads 6 are never

damaged by having come into contact with the wires of the leads 5. As a result, the productivity remains good and the reliability of connection can be upgraded. Therefore the stated purpose of HANDA is to improve the productivity and the reliability of connection even though leads are deformed by a method wherein steps are provided in between mutual leads, whose point parts are adjacent to each other, in a plural number of leads.

Applicant's Dependent Claims 37, 39, 42, 45, 48, 49 and 51

For the same reasons thoroughly discussed above with respect to the rejection of independent Claim 1, 9, 17, 23 and 29, Applicant submits that neither TANAKA '339 or TANAKA '053, whether considered individually or in combination, teach the aforementioned features as recited in independent Claims 1, 9, 17, 23 and 29. Furthermore, as also discussed above, MIYAMOTO does not remedy the deficiencies of TANAKA '339 or TANAKA '053.

Moreover, HANDA does not remedy the deficiencies of TANAKA '339, TANAKA '053 or MIYAMOTO. For instance, Figures 1-3 of HANDA do not teach or suggest the arrangement of alternating and oppositely oriented *recesses* on both the first and second subsets of leads. Instead, HANDA teaches *bending* (at 4) the inner end segment 3 of lead 2 upwards (see Figure 2). As a result, some of the inner ends 3 are raised higher than other inner ends 3. However, it is easily noticed in Figure 2 that HANDA does not teach any recesses.

Because neither TANAKA '399, TANAKA '053, MIYAMOTO nor HANDA teach or suggest the aforementioned features, no proper combination of these references can render unpatentable the combination of the features recited in at least independent Claims 1, 9, 17, 23 and 29. Thus, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of obviousness under 35 U.S.C. § 103(a) and that these rejections are improper and should be withdrawn.

Furthermore, Applicant submits that dependent Claims 37, 39, 42, 45, 48, 49 and 51 are allowable at least for the reason that these claims depend from allowable independent Claims 1, 9, 17, 23 and 29 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 37, 39, 42, 45, 48, 49 and 51 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

TANAKA '399 and '053 in combination with MIYAMOTO and HANDA:

Applicant respectfully traverses the rejection of Claims 3, 15, 20, 26 and 34 under 35 U.S.C. §103(a) as being unpatentable over the combination of TANAKA '399 and TANAKA '053 as applied to Claims 1, 9, 17, 23 and 29, and further in combination with MIYAMOTO and HANDA.

The Examiner submits that the combination of TANAKA '399 and TANAKA '053 does not appear to explicitly disclose wherein the recess of the inner end segment of the leads of the first subset does not extend to the inner end of a lead, and the leads of the first subset extend further toward a center of the leadframe than the leads of the second subset; wherein the recessed surface of one of the leads of these pairs does not extend to the inner end of the lead, and those leads extend further toward a center of the leadframe than the other lead of the respective pair; wherein the recessed surface of one of the leads of the pairs does not extend to the inner end of the lead, and those leads extend further toward the semiconductor chip than the other lead of the respective pair. The Examiner further submits that MIYAMOTO and HANDA disclose these limitations and therefore are applied to the rejection for the same reasons they were applied to the rejection of Claims 37, 39, 42, 45, 48 and 51.

Applicant's Dependent Claims 3, 15, 20, 26 and 34

For the same reasons discussed above, Applicant submits that neither TANAKA '339 or TANAKA '053, whether considered individually or in combination, teach the aforementioned features as recited in independent Claims 1, 9, 17, 23 and 29. Furthermore, as also discussed above, MIYAMOTO does not remedy the deficiencies of TANAKA '339 or TANAKA '053. Moreover, HANDA does not remedy the deficiencies of TANAKA '339, TANAKA '053 or MIYAMOTO.

Therefore, because neither TANAKA '399, TANAKA '053, MIYAMOTO nor HANDA teach or suggest the aforementioned features, no proper combination of these

references can render unpatentable the combination of the features recited in at least independent Claims 1, 9, 17, 23 and 29. Thus, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of obviousness under 35 U.S.C. § 103(a) and that these rejections are improper and should be withdrawn.

Furthermore, Applicant submits that dependent Claims 3, 15, 20, 26 and 34 are allowable at least for the reason that these claims depend from allowable independent Claims 1, 9, 17, 23 and 29 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 3, 15, 20, 26 and 34 under 35 U.S.C. § 103(a) and to indicate that these claims are allowable.

GURSKY and DREES:

Applicant respectfully traverses the rejections of Claims 23 and 27 under 35 U.S.C. §103(a) as being unpatentable over the combination of GURSKY and U.S. Patent No. 4,026,008 to Drees [hereinafter "DREES"].

The Examiner submits that GURSKY discloses a semiconductor package comprising a plurality of adjacent pairs of leads each including an inner end segment beginning at an inner end of the lead, wherein the inner end segments each include a recessed surface, and the recessed surface, and the recessed surfaces of the inner end segments of the leads of each of the pairs are oppositely oriented; a semiconductor chip in electrical connection with the inner end segments of the leads; and an encapsulant material; wherein the semiconductor chip is in a flip chip electrical connection for the inner end segments. The Examiner further notes that to clarify the disclosure of an encapsulant material, GURSKY discloses "encapsulation steps" and an encapsulant material which the Examiner asserts is an inherent result of the encapsulation steps.

However, the Examiner admits that GURSKY does not appear to explicitly disclose a hardened encapsulant material covering the semiconductor chip, the conductors, and the inner end segments of the leads. The Examiner points out that, at column 6, lines 5-55, DREES discloses a hardened encapsulant material 19 covering the semiconductor chip 17, the conductors 18 and the inner end segments of the leads. The Examiner then submits that it would have been obvious to combine this product of DREES with the product of GURSKY

because it would enable the encapsulation of GURSKY. The Examiner further states that to further clarify the disclosure of a hardened encapsulant material this is an inherent result of the “injection molding process” of DREES.

A Review of DREES

DREES discloses a semiconductor lead structure and assembly and method for fabricating the same. In particular, Figure 4 shows a plan view of the contact lead array 12 with a semiconductor body 17 attached thereto. After the semiconductor body 17 has been attached to the lead structure 12, the semiconductor body 17 in convoluted portions 14c of the contact leads 14 is encapsulated in a first encapsulating means 19 of an insulative material which may be a suitable plastic to form a packaged integrated circuit 20. The encapsulating means 19 is in the form of a disc and thus may be termed a pill or pill-like package with the outer extremities of the leads 14 being free of the insulating material. The encapsulation for all the packaged integrated circuits 20 may be accomplished simultaneously or it may be accomplished sequentially. In accordance with techniques well known in the art, a formal coating of liquid silicone may be applied to the semiconductor body 17 and portions of the contact leads 14, followed by an injection molding process were applied to plastic insulating material. As can be seen from Figure 5, the encapsulating material encompasses an inner portion of the supporting tabs 16 and encompasses the convoluted portions 14c of contact leads including the notches 15 formed therein.

Applicant's Dependent Claims 23 and 27

For the same reasons discussed with respect the §102(b) rejection of independent Claim 17, Applicant submits that neither GURSKY or DREES, whether considered individually or in combination, teach the aforementioned features as recited in independent Claim 17.

For instance, DREES does not remedy the deficiencies of GURSKY since it does not teach or suggest. *inter alia*, **the recessed surfaces of the inner end segments of the leads of each of the pairs being oppositely oriented**, as is recited in independent Claim 17. Instead, DREES was set forth by the Examiner to provide a teaching for the encapsulation process of semiconductor packaging.

Therefore, because neither GURSKY nor DREES teach or suggest the aforementioned features, no proper combination of these references can render unpatentable the combination of the features recited in at least independent Claim 17. Thus, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection of obviousness under 35 U.S.C. § 103(a) and that this rejection is improper and should be withdrawn.

Furthermore, Applicant submits that dependent Claims 23 and 27 are allowable at least for the reason that these claims depend from allowable independent Claims 17 and recite additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 23 and 27 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

Application is Allowable

Applicant respectfully submits that each and every pending claim of the present application meets the requirements for patentability, and respectfully requests that the Examiner indicate the allowance of such claims.

CONCLUSION

Applicant respectfully submits that each and every pending claim of the present application meets requirements for patentability under 35 U.S.C. §§ 112, 102 and 103. Accordingly, allowance of the present application and all the claims therein is respectfully requested and believed to be appropriate.

In view of the foregoing, it submitted that none of the references of record, when considered either alone or in any proper combination thereof, anticipate or render obvious Applicant's invention as recited in Claims 1, 3-4, 6-12, 14-17, 19-24, 26-31 and 33-52. The applied references of record have been discussed and distinguished, while significant claimed features of the present invention have been pointed out.

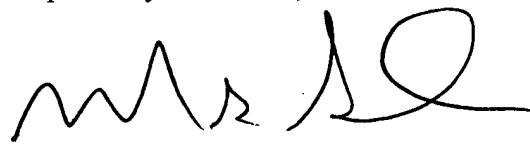
Furthermore, any amendments to the claims which have been made in this response and which have not been noted to overcome a rejection based on the prior art, should be considered to have been made for a purpose unrelated to patentability and no estoppel should be deemed to attach thereto.

If any additional fee is required, please charge Deposit Account Number 19-4330.

Respectfully submitted,

Date: 2/22/05

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